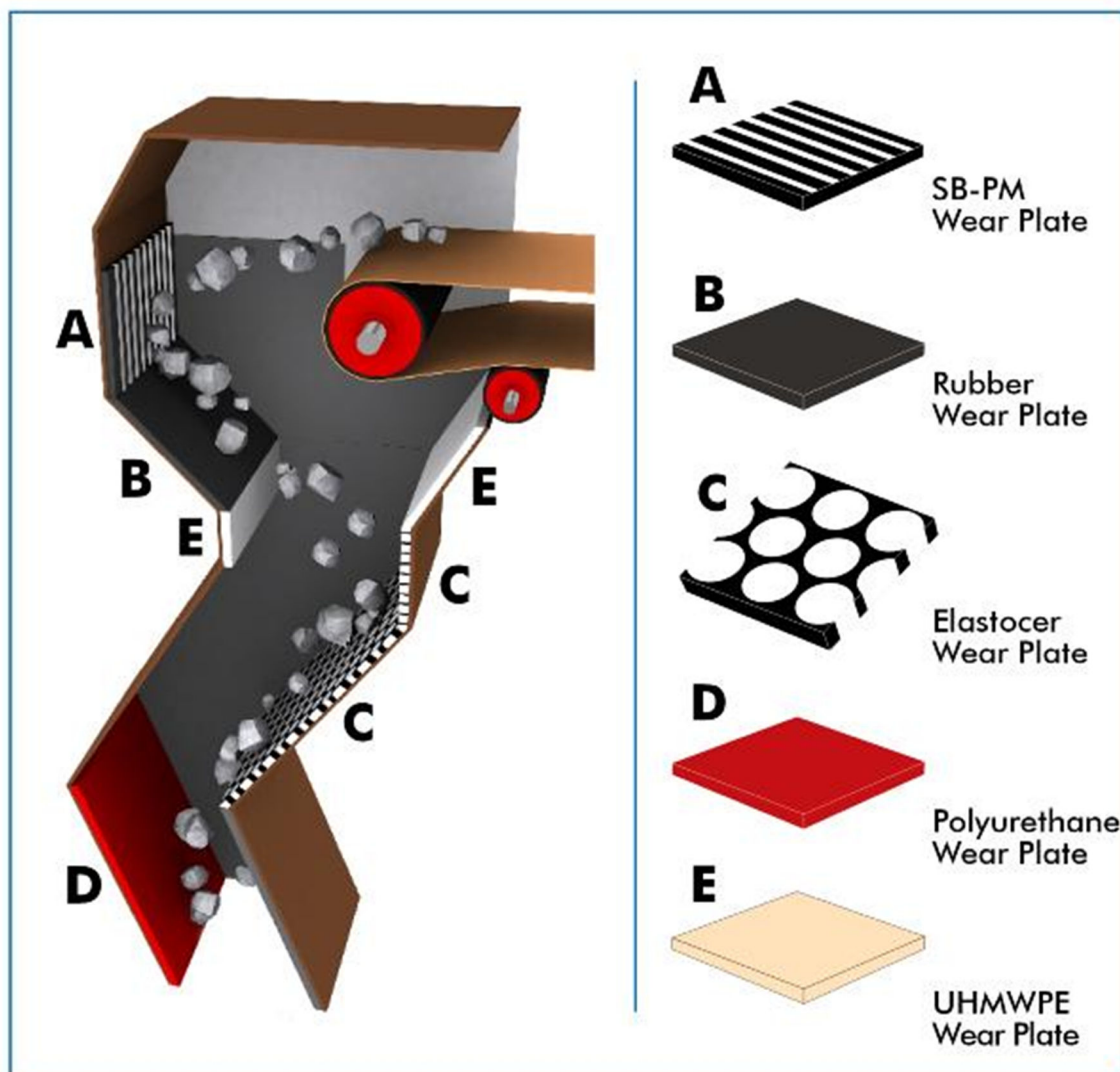


## Combination Liner Technology

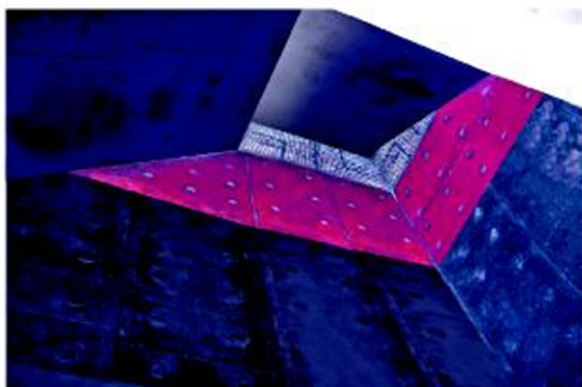
Conventionally, mild steel, case hardened steel plates or stainless steel plates are used as lining material. However, metallic liners that are conventionally used for material handling require frequent replacement. The cost of resultant downtime, manpower & that of the liners is matter of prime concern to the plant manager. Different faces of chutes/ hoppers/ bins require varying degree of impact/ wear resistance and flow ability. A single lining material cannot meet the diverse requirement, calling for combination lining. Tega specialized rubber, polyurethane, polyethylene & ceramic embedded improvised liners provide an ideal solution to such problems.

Tega has the widest range of liners in special wear resistant rubber, polyurethane, polyethylene, high alumina contained ceramic embedded rubber liner for wear/ impact resistance and flow promotion in various applications.

Tega's dedicated team of engineers select the type of liners that provides integrated solution to all wear & flow problems, based on study of the application. Today, as a result of this powerful combination-liner-technology based on most cost economic & application oriented selection backed by a database of 14000 different applications, coupled with on-site experience of more than twenty eight years, Tega is the undisputed leader in providing solutions in the field of wear resistance and flow promotion.



Typical Combination Lining for a Chute



Installation of combination liner in a hopper for resisting impact as well as promoting flow



#### Typical Combination Lining for a Chute/Hopper

Tega provides a variety of wear resistant & flow promotion liners according to the requirements & needs of the customer. The following liners can be used in combination for providing a suitable solution to wear & flow problems—

- Tega Rubber "SB" liners
- Tega Special Steel Inserted Rubber "SB-PM®" liners
- Tega Serrated Rubber "PSB" liners
- Tega Polyurethane "PU" liners
- Tega Special Steel inserted Polyurethane Liner "PU-PM®" liners
- Tega UHMW Polyethylene Liner
- Tega Elastocer, Ceraflex, Ceraflo liners

In addition to the above liners, Air Blaster is also used sometimes to remove & prevent blockages and buildup in critical applications.

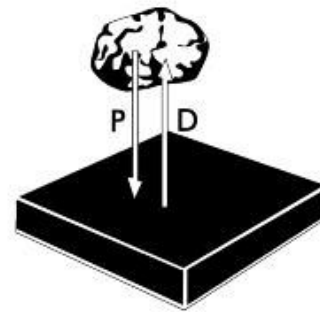
Tega Industries Limited

147, Block - G, New Alipore, Kolkata - 700 053 Ph: +91 33 30019000 / 23963512 / 23963515  
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## TEGA WEAR RESISTANT RUBBER LINERS

Rubber as a lining material has proved to be very useful in material handling applications due to its inherent dampening properties. The dampening effect of a rubber liner depends on angle of impact. When a material hits the wear plate at an angle ( $\alpha$ ) as in chutes, launders, hoppers, skips, feeders and similar installations, the impact force (P) can be resolved into a perpendicular force (D) and a shearing force (S). The perpendicular force will get dampened without causing any wear & permanent deformation, whereas the shearing force causes the actual wear, which increases with decrease in angle of impact. In such cases where angle impact is low, serrated rubber plates can be installed to achieve an impact angle close to 90°.

Tega wear resistant rubber liners are manufactured from special rubber compound by high pressure moulding which imparts abrasion, impact & corrosion resistant properties to these liners. These liner plates are available in solid type (SB-S) & reinforced type at hole position (SB-R). The wear pattern of these elements can be predicted fairly accurately which enables proper maintenance planning & hence reduces the overall costs.



*SB Liner – Reinforced*



*SB Liner – Solid*

### Product Range

(SB-Solid and SB-Reinforced type)

500 mm × 1000 mm

500 mm × 1250 mm

750 mm × 1000 mm

750 mm × 1250mm

1220 mm × 1800 mm

### Thickness

T= 30,40,50,60,80,100,120 mm

Irregular Size as per requirement

### Application Area

Primary & Secondary impacts, sliding & abrasion zones for Chutes, Hopper, Bins, Deck plates of Feeders etc.

Rubber plates are also available with 5 to 10 mm thick steel backing (SB-ST) for rigid fixing with the mother plate & to prevent bulging, floating, sagging from high impact loads.



Serrated Rubber Liners are toothed wear plates available both as solid plates (PSB-S) & plates with reinforced molded holes (PSB-R). The liners are also available in the steel backed form. With serrated profile of liner, the speed of material in contact will be reduced resulting in decreased abrasion. This is required when material flow velocity is very high i.e. above the critical speed.



**Application Area**

Primary & Secondary impacts, sliding & abrasion zones for Chutes, Hopper, Bins, Deck plates of Feeders etc.

SB-PM® wear plate is a new generation composite product with high wear & impact resistant special steel inserted ribs within a resilient rubber matrix. The extremely hard steel element provides unsurpassed resistance to wear and impact absorbing the perpendicular force while the other shearing forces will be absorbed by Rubber due to its dampening properties. Tega Wear resistant SB-PM wear plate is used in high wear & impact areas where continuous plant operation is more important than cost of liner materials.



**Application Area**

Primary & Secondary impacts, sliding & abrasion zones for Chutes, Hopper, Bins, Deck plates of Feeders etc.

**Product Range**

**Plate Size**  
510 mm × 510 mm  
Irregular size as per requirement  
**Thickness**  
T= 40,60,80,100,120 mm

In addition to the above, Rubber liners with Heat Resistant & Flame Retardant properties called FSB Liners is a unique product developed by Tega for hot material handling applications e.g. wharf coke, sinter, slag etc.

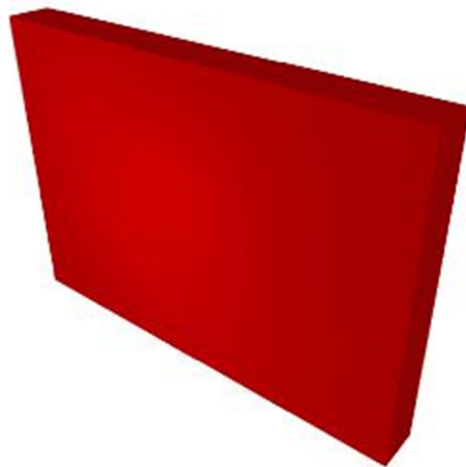
**Advantages of Rubber Liners**

<ul style="list-style-type: none"> <li>Enhanced elasticity &amp; dampening property absorbs impact loads providing cushioning effect.</li> </ul>	<ul style="list-style-type: none"> <li>Longer life resulting Lowercost/ton.</li> </ul>
<ul style="list-style-type: none"> <li>High resilience dissipates the heat load developed due to intermittent loading.</li> </ul>	<ul style="list-style-type: none"> <li>Less weight with respect to steel , hence easier to install.</li> </ul>
<ul style="list-style-type: none"> <li>Fire resistance from red hot Bulk Materials conforming protection to the structure.</li> </ul>	<ul style="list-style-type: none"> <li>Safe operation &amp; prevents conveyor damage.</li> </ul>
<ul style="list-style-type: none"> <li>Low hardness compared to steel , reduces mineral degradation &amp; tonnage loss in sized mineral handling.</li> </ul>	<ul style="list-style-type: none"> <li>Lower inventories can be maintained due to predictable wear pattern.</li> </ul>

## Polyurethane Liners

Polyurethane elastomers are a synthesis of polyols & isocyanides chain extended or cross linked into giant molecular complexes. This material has combined properties of rubber as well as plastic.

Polyurethane wear plates are normally steel backed plates where steel is bonded with polyurethane available in customized sizes. The backing steel prevents fines to penetrate beneath & hence bulging of the liner which may cause its dislodging. They are harder materials compared to Rubber but softer than Plastics and provide an excellent degree of abrasion resistance.



### Product Range

#### Plate Size

500 mm × 500 mm

500mm × 1000 mm

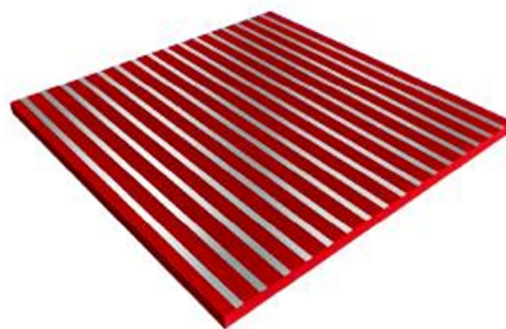
Thickness = 15 to 100mm

Irregular Size as per requirement

### Application Areas

Chutes, Hoppers & Bins for sticky, Hygroscopic & abrasive materials especially for Fines. Also suitable for curved and bend surfaces.

Apart from Steel Backing Polyurethane Liner, PU-PM wear plates comprises of Special Steel Inserted ribs bonded within Polyurethane, which enhances the impact resistance of Polyurethane. Specially used for application where abrasion and impact has equal importance towards wear.



### Product Range

#### Plate Size

500 mm × 500 mm

Thickness = 30, 40, 60 mm

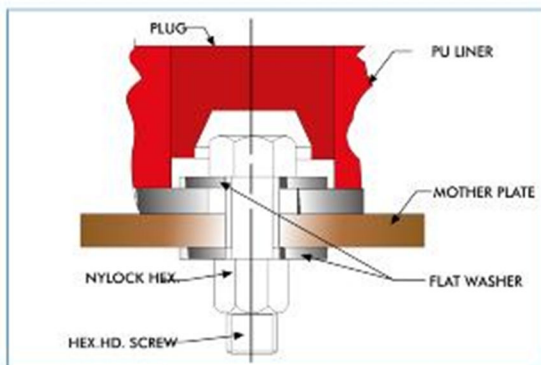
Irregular Size as per requirement

### Application Areas

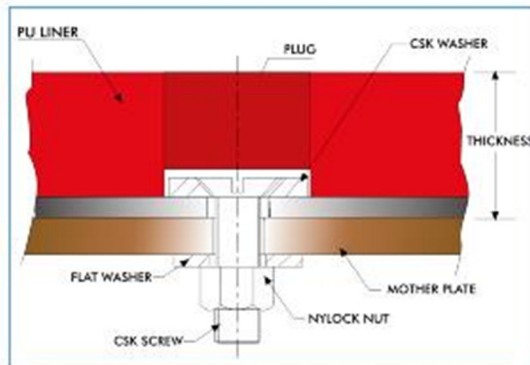
ROM Circuit Chutes and Hoppers

### Fixing Attachment:

Polyurethane Liners are generally fixed to the mother plate by bolts or studs with the help of counter sunk washers, flat washers and nuts. Plugs are applicable for Liner thickness of above 25 mm.



Hex head bolt fixing



CSK Screw Fixing

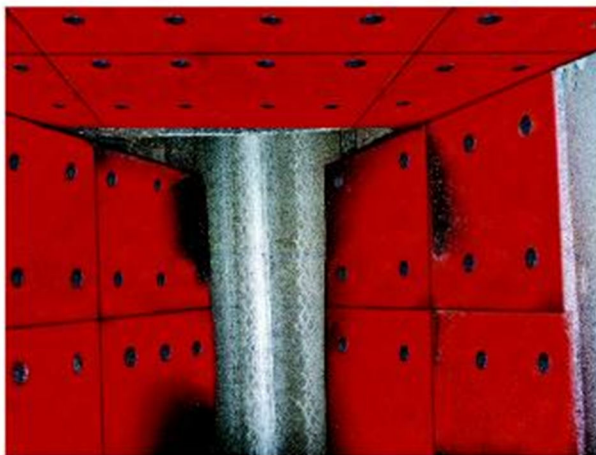
### TYPICAL APPLICATION OF TEGA PU LINER

Liner installed in a chute handling coal under following operating data.

Lump Size: (-) 75 mm

Capacity: 400 TPH

Height of drop: 2 mtr



### ADVANTAGES OF POLYURETHANE LINERS

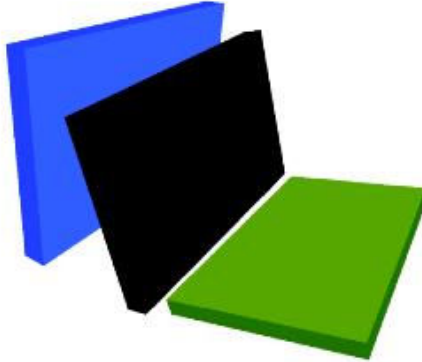
Features	Benefits
■ Highly Abrasion resistant	■ Prevents abrasive wear for materials like Iron ore, coke.
■ Wide range of resilience	■ Impact resistant
■ Low coefficient of Friction	■ Offers good Flowability & prevents jamming patterns
■ Low temperature flexibility	■ Lining of curved surfaces like conical hoppers, bins etc.

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## UHMW Polyethylene Liners



Ultra high molecular weight Polyethylene (UHMWPE) is a resin based product having molecular weight greater than 4 million gms /mol. It is important that we do not confuse UHMWPE with high-density Polymer (HDPE) because the latter does not exhibit superior wear characteristics as that of the former due to its lower molecular weight. In general, as the molecular weight of polyethylene increases, its abrasion resistance and non stick characteristics are enhanced. UHMWPE liners are extensively used all over the world as ideal flow promotion liners.

### Product Range

#### Plate Size

1000 mm × 1000 mm

1000 mm × 2000 mm

Thickness = 10 to 60

Irregular Size on Special Request

### Application Area

Chutes, Silos , Bins, Launder for Fines Handling

Reclaimer Buckets , Conveyor Skirting

**Wear Products**

### TYPICAL APPLICATION OF TEGA UHMWPE LINER

Liners installed in Wagon Tippler Hopper handling Iron Ore under the following operating data:

Lump Size: Fines

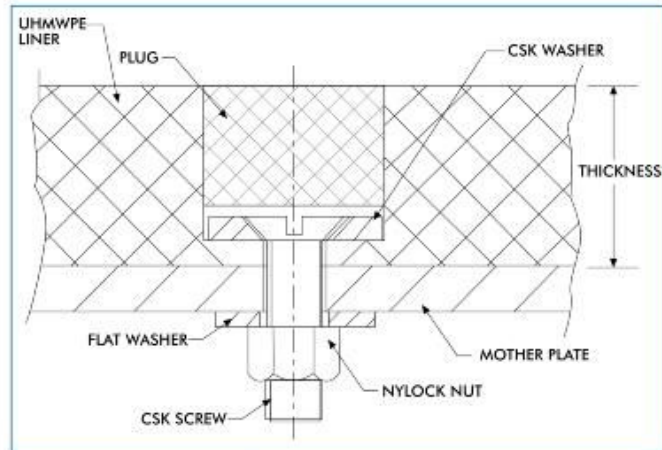
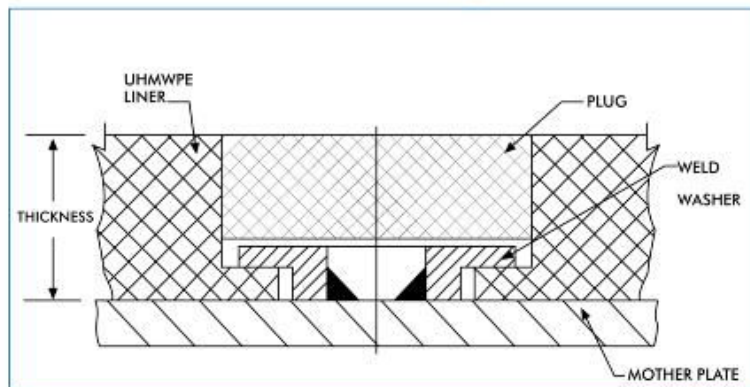
Capacity: 600 TPH.

Height of drop: 3-4 mtr.



**FIXING ATTACHMENT FOR UHMWPE LINER:**

Polyethylene liners are fixed to the mother plate either by CSK screw, CSK washer, nuts and flat washers or by weld washers. Plugs are applied to smoothen liner surface at the fixing positions which are applicable for thickness of above 15 mm.

*CSK Screw Fixing**Weld Washer Fixing***Advantages of UHMW Polyethylene Liner**

- Excellent abrasion Resistance from many Bulk Solids Sliding in Hoppers.
- Very low coefficient of Friction which can result in shallower hopper angles required to move frictional Bulk Solids when compared to steel liners.
- Zero moisture absorption which reduces the likelihood of a bulk solid freezing to its surface.
- Lightweight construction compared to steel liners which makes it ideal for retrofit situation.
- Manual (hand) formation for most conically shaped hoppers or mechanical formation using standard steel bending & rolling equipment.
- Chemical & corrosion resistant; unaffected by organic chemicals upto 95 deg.
- Improves flow rates & extremely useful for conversion from **Funnel flow to Core Flow**.

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## Elastocer Liner



Until now, the only materials that have been able to come close to withstand the amounts of wear involved have been with rubber, cast white iron alloys and various grades of abrasion resistant steel plate. But with Elastocer, the problem of abrasive wear in material handling arising out of high feed rates and velocities, combined with low angles of impact has been minimized to great extent. This unique liner, in some applications, is as much as 12 times more resistant to wear than the toughest steel.

Elastocer is a new-generation composite product with a highly wear resistant surface of cylindrical alumina ceramic rods bound within a resilient rubber matrix. The extremely hard ceramic elements provide unsurpassed resistance to wear, while the elastic properties of rubber effectively dampen the impact forces. These plates are necessarily steel backed. Used in heavy wear areas characterized by both impact & abrasion with small angle of impact where cost to life ratio is more important than low initial cost.

### Product Range

#### Elastocer Plate Size

500 mm × 500 mm

500 mm × 250 mm

305 mm × 305 mm

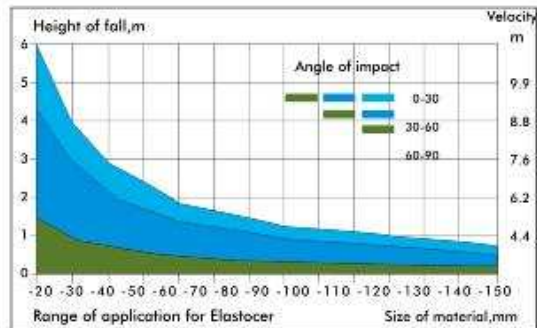
Plate Thickness = 30, 50

Irregular size on Special request

### Applications Area

Application includes screen chutes, tripper deflector walls, launders, conveyor transfer points, feeder side walls etc.

Graph representing a summary of operating conditions where Elastocer displays unsurpassed cost performance.



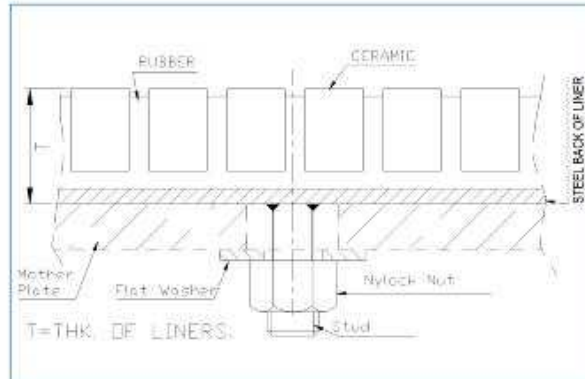
### Advantages of Elastocer Liners

Features	Benefits
■ Twelve times more durable than Steel (proven by trials)	■ Reduces cost of Annual Maintenance & Wear protection material
■ Enhanced service life at critical operating conditions	■ Reduces shut down frequency, hence production cost
■ Severe abrasion resistant	■ Prevents jamming & corrosion
■ Predictable wear pattern	■ Reduces production downtime

### FIXING ATTACHMENT FOR ELASTOCER LINER

Elastocer liner is conventionally fixed to the mother plate by stud welded at the back of the wear plate by nuts & flat washers as shown below.

Also, alternative fixing by bolts, flat washers and nuts can be done on specified requirement.



Two more variants of ceramic based rubber liner developed are:

#### CERAFLEX LINER

This is a ceramic tile embedded rubber liner with 100% ceramic exposed area. The hexagonal / square tiles provide smooth surface to flow and abrasion resistance for sized materials, whereas rubber provides impact resistance from light loads. It is fixed by means of stud, welded to the steel backing surface just like Elastocer liner.



#### Product Range

##### Ceraflex Plate Size

500 mm × 500 mm

300 mm × 300 mm

Plate thickness: 20 to 75 mm

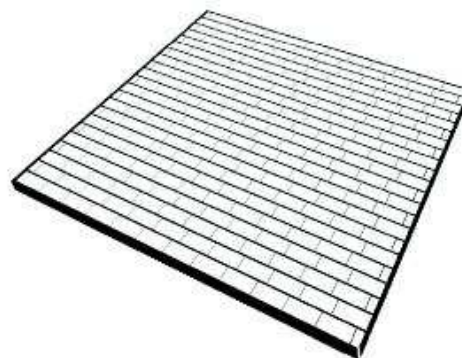
Irregular size on Special request

#### Applications Area

Typically used in Hot Material Handling applications like Sinter, Slag etc.

#### CERAFLO LINER

This is another kind of high alumina content ceramic tile embedded in resilient rubber matrix. The ceramic tile is rectangular in shape. It is a highly flexible liner and can be folded or bend to fit curved surfaces. It is backed by protection sheet and fixed by means of adhesive or hot vulcanisation process.



#### Product Range

##### Ceraflo Plate Size

500 mm × 500 mm

Plate Thickness = 5, 10, 15, 20, 25 mm

Irregular size on Special request

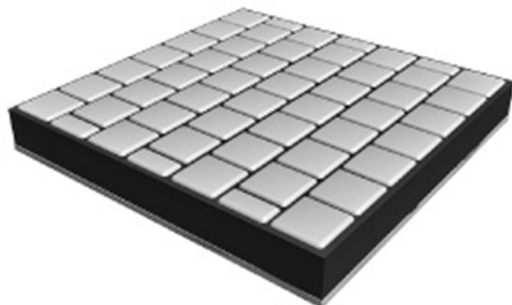
#### Applications Area

Typically used in chutes, launders, feeders etc. having curved and bend surfaces handling very abrasive materials.

TOTAL : Solution™



## D-MAC Ceralock



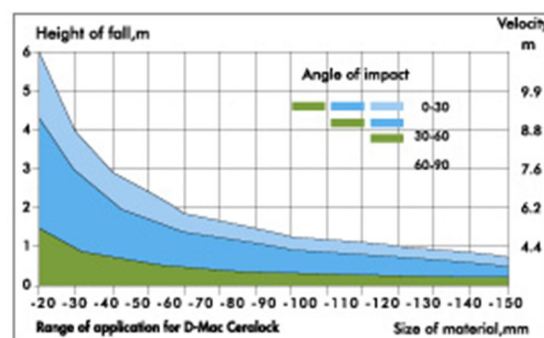
Ceramic liners have been in use in the bulk solid handling industries to address the problem of high wear and abrasion. However, during different application, the liner is subjected to not only abrasion wear but also certain degree of Impact wear. Ceramic tiles when cemented directly on the steel surface has the advantage of resisting abrasion wear but can not absorb impact energy, this has resulted in development of liners with ceramic embedded in rubber matrix. It has been observed that the conventional ceramic liners during operation has a tendency of ceramic blocks getting dislodged. Once a single block getting dislodged, then that area becomes the source for adjacent ceramic blocks to get dislodged. This leads ultimately the failure of the liner.

Tega has developed unique ceramic lining where the ceramic blocks are mechanically interlocked, apart from bonding the ceramic block with rubber in its vertical as well as horizontal surface, thereby eliminating any chance of dislodging of the ceramic blocks. Since the ceramic blocks are embedded in the rubber matrix covering (bottom as well as vertical surfaces) it helps to withstand medium duty impact load. These liners are provided with steel backing to facilitate fixing with the help of studs.

Product Range		Applications Area
<b>Plate size</b>	<b>Plate thickness</b>	Screen chutes, tripper deflector walls, launders, conveyor transfer points, feeders side walls etc.
300mm x 300mm	40mm,50mm,60mm	
300mm x 600mm	40mm,50mm,60mm	
500mm x 500mm	60mm,75mm	
Irregular size on special request		

D-MAC Ceralock

Graph representing a summary of operating conditions where D-Mac Ceralock displays unsurpassed cost performance.



### Advantages of D-Mac Ceralock displays

Features	Benefits
■ Twelve times more durable than Steel ( Proven by trials)	■ Reduces cost of annual maintenance & replacement cost
■ enhanced service life at critical operating condition	■ Reduces shut down frequency, hence increase productivity
■ Low co-efficient of friction	■ Prevents jamming
■ Predictable wear pattern	■ Planned Maintenance
■ Interlocking ceramic design	■ No ceramic dislodgement during operation.

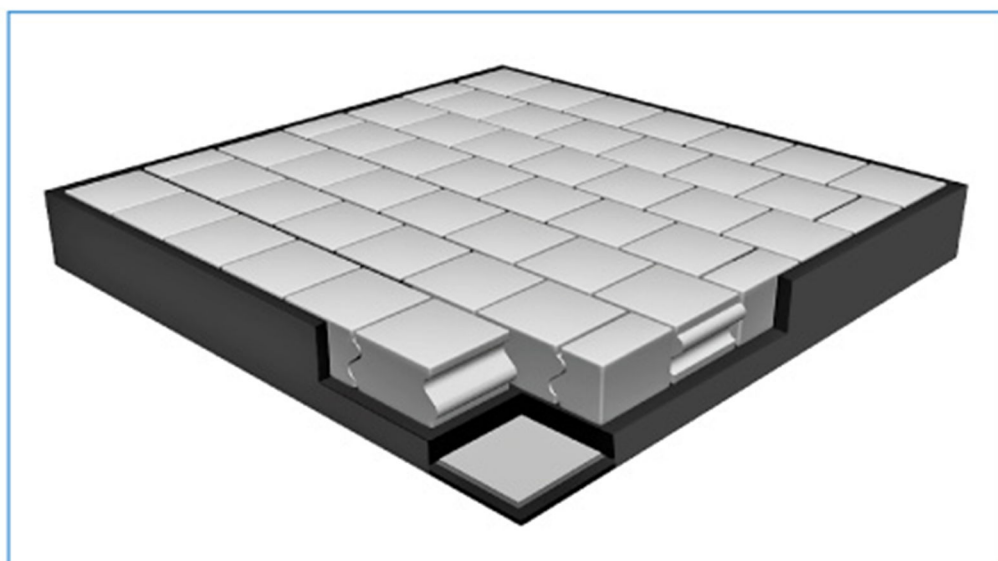
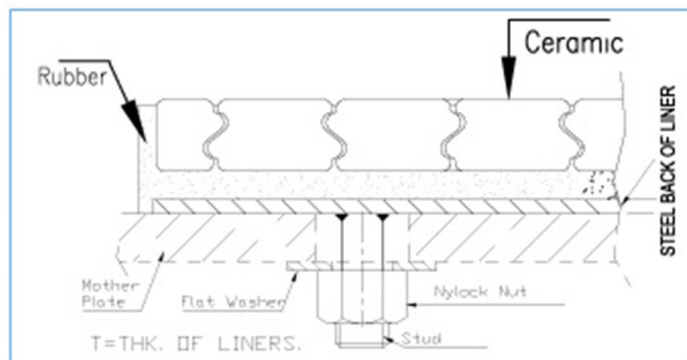
TOTAL : Solution™



#### FIXING ATTACHMENT FOR D-MAC CERALOCK LINER

D-Mac Ceralock Liner is conventionally fixed to the motherplate by stud welded at the back of the wear plate by nuts & flat washers as shown below :

Also, alternative fixing by bolts, flat washers and nuts can be done on specified requirement.



CERALOCK - A VIEW OF MECHANICAL INTERLOCKING



Screen underflow chute lined with D-Mac Ceralock

## Mosaic Liner



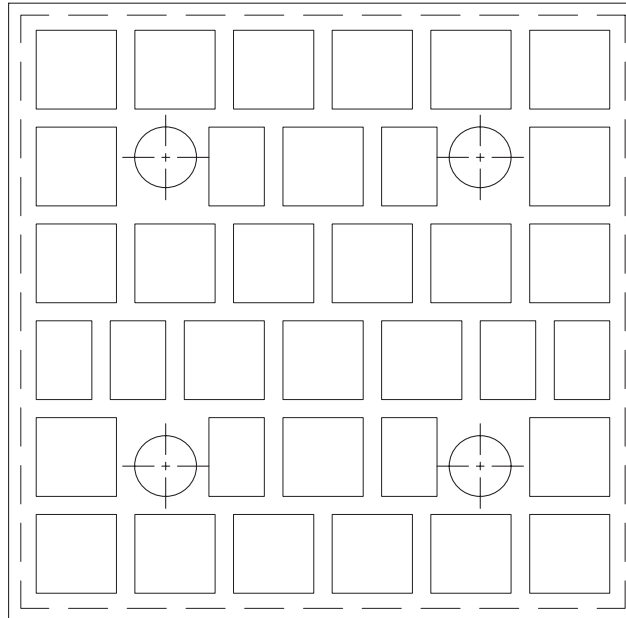
A new generation composite lining which has the advantage of steel as well as rubber. The high hard steel, placed in rubber matrix gives excellent resistance to impact wear together with absorption of impact energy giving the liner extended working life of three to four times than liners made either of steel or rubber. An additional layer of rubber under steel back plate gives the liner extended life under very high impact application.

This patented (applied) product design is ideally suitable for chutes/ hoppers handling lump ores. The spacing of steel in the rubber matrix has been done in the manner which makes the liner suitable to handle even sized ores mixed with lump ores. The edges of the liner are made of rubber ensuring that unlike steel liner, MOSAIC LINER will not rip the conveyor belt in the eventuality of the liner dislodging from the chute/hopper.

Product Size	APPLICATION AREAS
MOSAIC LINER is available in various sizes & thickness, provided according to customers requirements.	Impact areas of chutes and hoppers

FEATURES	BENEFITS
<ul style="list-style-type: none"> <li>Special High Hard Steel is embedded in Special Rubber matrix</li> </ul>	<ul style="list-style-type: none"> <li>Improves high impact wear life</li> <li>Longer life than only rubber or steel liners</li> <li>Reduced sound as compared to steel liners</li> <li>Improves energy absorption</li> </ul>
<ul style="list-style-type: none"> <li>Innovative Design</li> </ul>	<ul style="list-style-type: none"> <li>Eliminates chances of belt damage in case of liner dislodging</li> <li>Eliminates fines generation and degradation</li> </ul>

### MOSAIC LINER FIXING ARRANGEMENT



MOSAIC LINER is conventionally fixed to mother plate with nut and bolt fastening. Alternatively studs can be used accordingly for specific requirements.

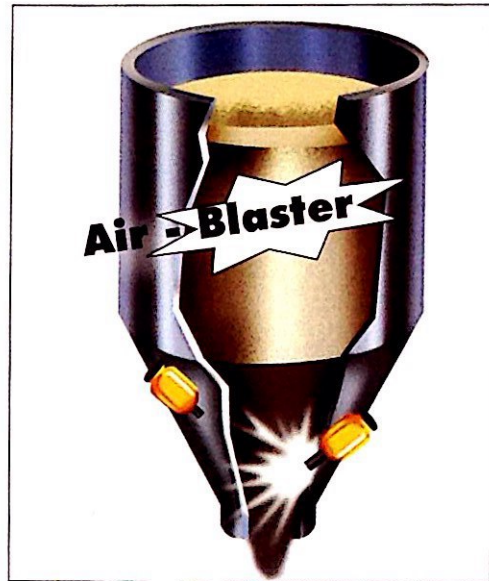


TEGA MOSAIC LINERS INSTALLED IN CHUTE HANDLING IRON ORE LUMPS

## Air-Blaster

Air-Blasters are used to remove and prevent blockages and build up in critical applications along with suitable liners. Generally these jamming patterns can be removed by the liner itself. However in case of huge deviation in hopper half angle and opening or discharge dimension (diameter or diagonal) from that of the same for a perfectly designed funnel flow hopper working under same circumstances, these blockages become critical where the blasting system is employed as an aid to the liners.

A quantity of compressed air at 4-8 bar (60- 120psi) is released in a few milliseconds as a blast into the bin, at the position of the blockages. The impulse of the blasting force (the energy released) overcomes the compressive strength of the material and thus, free flow is restored.

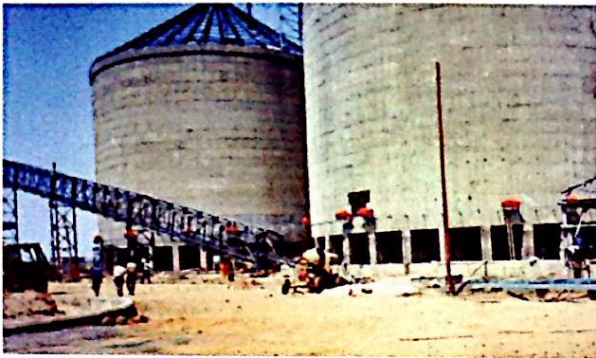


The Air-Blasters are fired in an adjustable sequence by means of an electronic control box, to its full effect, to generate free flow. As the quantity of air is small in proportion to the volume of the bin, the energy is dissipated and absorbed, causing no harm to the structure.

Product Range	
Type	Capacity in Litres
AB 25NT	24
AB 50NT	48
AB 100NT	96
AB 150NT	144
AB 200NT	192
AB 315NT	302

Advantages	Features
<ul style="list-style-type: none"> <li>■ Only one moving part, light &amp; fast Therefore the most powerful canons.</li> </ul>	<ul style="list-style-type: none"> <li>■ Low energy consumption.</li> </ul>
<ul style="list-style-type: none"> <li>■ Practically no maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>■ Simple fitting.</li> </ul>
<ul style="list-style-type: none"> <li>■ Resistant to all weather conditions.</li> </ul>	<ul style="list-style-type: none"> <li>■ Usually the Bin or hopper needs not to be emptied during fitment.</li> </ul>
<ul style="list-style-type: none"> <li>■ Simple Operation.</li> </ul>	<ul style="list-style-type: none"> <li>■ Full capacity of hopper can be utilized.</li> </ul>

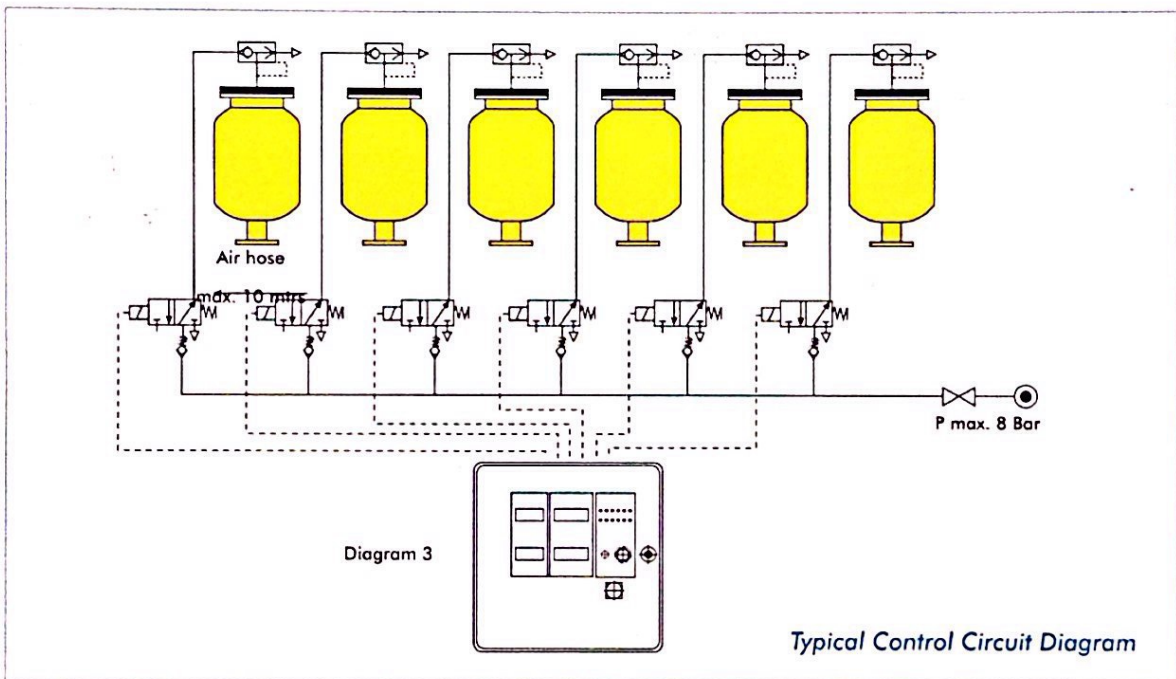
TYPICAL APPLICATION OF TEGA AIR BLUSTER



Installation on a Silo



Installation on a Discharge Chute



Electronic Control Box:

- The unit is designed to fire 3 to 12 air canons automatically in accordance with a pre-set program.
- The interval between individual blasts can be set from 1 sec to 99 min.
- The cycle time from the last blast of a series can be set from 1 min to 99 hrs.
- An LCD digital display showing programmed intervals and cycle status is clearly visible on the outside of the cabinet door.
- The control circuit can be switched on or off with a key-operated switch in the cabinet door.
- A manual override push button and a selector marked from 1 to 12 are also mounted on the cabinet door and enable any air canon to be selected and fired at will.